RESULTS REGARDING THE SEWAGE SLUDGE APPLICATION OVER THE MAIZE YIELD QUANTITY AND QUALITY BETWEEN 2003 AND 2005

REZULTATELE APLICĂRII NĂMOLULUI ORĂŞENESC ASUPRA CANTITĂŢII ŞI CALITĂŢII RECOLTEI DE PORUMB ÎN ANII 2003-2005

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Abstract: *This paper presents the influence of sewage sludge fertilization upon the quantity and quality of maize crop. The researches were made on the cambic chernozem of Didactic Station from Timisoara. After maize harvest were calculating the yields and were made plant's analysis to follow the next indicators: total nitrogen, raw protein, phosphorus content, and potassium content from the maize grains.*

Rezumat: *În această lucrare se prezintă influenţa fertilizării cu nămol orăşenesc asupra cantităţii şi calităţii recoltei de porumb. Cercetările au fost efectuate pe cernoziomul cambic al Staţiunii Didactice de la Timişoara. După recoltarea porumbului au fost calculate producţiile si efectuate analize de plantă urmărindu-se indicatorii: azotul total, proteina brută, conţinutul în fosfor şi potasiu al boabelor de porumb.*

Key words*: sewage sludge, yield, fertilization, maize crop quality*
Cuvinte cheie*: nămol, fertilizare, producţie,calitatea recoltei de porumb*

INTRODUCTION

In Romania, as in the majority of the European countries, annually results big quantities of sewage sludge after the treatment of the wastewaters. That sludge might be used in agriculture after the European Union low for the sludge, low that was adopted by Romania too. The essentials conditions for that sludge to be utilized in agriculture are, not to have a high concentration in heavy metals and pathogens microorganisms, to avoid the soil pollution and crop's pollution.

MATERIAL AND METHOD

After maize fertilization with different sludge doses (0, 20, 40, t/ha), were preloaded plant's samples to be analyzed, exactly maize grains. The maize variety cultivated on the cambic chernozem from Timisoara is Vasilica, Pioneer trade.

Total nitrogen was determinate by Kjeldahl method. The raw protein content (%) was determinate by calculation.

The phosphorus content was determinate by colorimetric method, in acetic acid 2% extract.

The potassium from the maize grains was determinate by emission spectrometry method to an atomic absorption spectrophotometer Buck Scientific.

RESULTS AND DISCUSSIONS

As it shown in table 1, highest average maize grain yield was obtained, after three years of experimentation, in plots fertilized with 40t/ha sewage sludge, ranged between 4321 kg/ha, in first repetition, and 4600kg/ha, in third repetition.

Table 1

The effect of sewage sludge fertilization over the maize yield between 2003 and 2005

Repetition	Variant	Average values 2003-2005			
		Yield kg/ha	Relative values%	Difference kg/ha	Signification
R1	0 t/ha	3710	100	-	-
	20 t/ha	4153	112.13	443	***
	40 t/ha	4321	116.66	611	***
R2	0 t/ha	3790	102.33	80	-
	20 t/ha	4215	113.80	505	***
	40t/ha	4534	122.41	824	***
R3	0 t/ha	3820	103.14	110	-
	20 t/ha	4230	114.21	520	***
	40 t/ha	4600	124.2	890	***

DL 5 % = 180.2
DL 1 % = 245.4
DL 0.1 % = 329.9

Fertilization with 20t/ha sewage sludge brings a rise of maize grain yield, compared with control plot (0t/ha sewage sludge), ranged between 443 – 520 kg/ha. Compared with unfertilized plots, after sewage sludge fertilization, maize yields are increased with 22.25 kg maize grain/ t sewage sludge.

Highest maize grain yield obtained after sewage sludge fertilization is 4600 kg/ha, which means a rise of 24.2% compared with control plot.

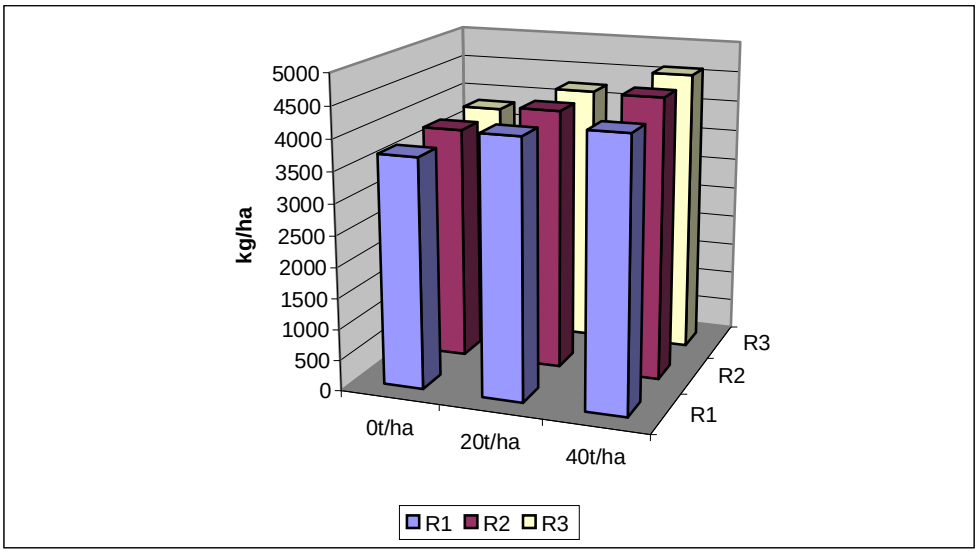

Fig.1 The effect of sewage sludge fertilization over the maize yield between 2003 and 2005

Generally, the content in total nitrogen of maize grains is between 0.7 % and 2.4 % and the raw protein content is finding between 4.0 % and 14 %.

After the analysis that were made we obtained the results from the table 2.

Table 2

The content in total nitrogen and raw protein of maize grains between 2003 and 2005

Repetition	**Variant**	**Average values 2003-2005**	
		Nt (%)	**P_B (%)**
R1	0 t/ha	2.000	12.490
	20 t/ha	2.140	13.383
	40 t/ha	2.406	15.050
R2	0 t/ha	2.160	13.496
	20 t/ha	2.300	14.356
	40 t/ha	2.330	14.526
R3	0 t/ha	2.070	12.933
	20 t/ha	2.353	14.700
	40 t/ha	2.413	15.086

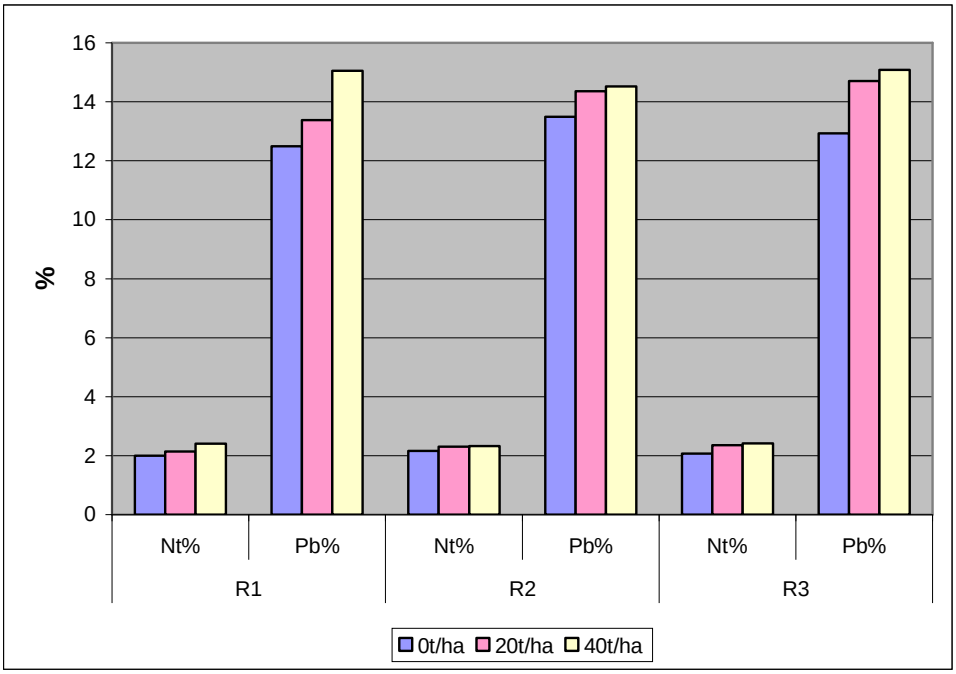

Fig. 2 The content in total nitrogen and raw protein of maize grains between 2003 and 2005.

From the data presented in the table, we observe that the content in total nitrogen is modifying after the sewage sludge fertilization.

In variants unfertilized with sludge, as control, it was determinate a value between 2.00 % and 2.160 % between the years of experiment 2003-2005.

When we applied 20 t/ha sludge the content in total nitrogen is find between 2.140 % and 2.353 %.

In the case of the variants fertilized with 40 t/ha sludge it was determinate a content in total nitrogen between 2.330 % and 2.413 %.

The content in total nitrogen from the maize grains is increasing once with the dose of sludge applied.

Regarding the content in raw protein of the maize grains, it is modified once with the dose of the sludge, and we observe an increasing from the control variants to the variants fertilized with the maxim dose of sludge, 40 t/ha.

In control variants, we obtained the values between 12.490 % and 15.086 % in the period 2003 -2005.

In the variants fertilized with 20 t /ha, the content in raw protein is between 13.383 % and 14.700 %.

The maxim dose of sewage sludge 40 t/ha determine a concentration in raw protein between 14,526 % and 15,086 %.

In the years of experiment, we observe an important modification of the content in total nitrogen and raw protein from the maize grains, the values being over the normal limits, in almost the variants. This might be explained that in the second year of sewage sludge application is producing a strong mineralization of the organic matter of the soil, and soil content in nitrogen is very good.

Table 3

The effect of sewage sludge fertilization over the content of phosphorus and potassium of the maize grains between 2003 and 2005

Repetition	**Variant**	**Average values 2003-2005**	
		P_2O_5 %	**K_2O %**
R1	0 t/ha	0,510	0.306
	20 t/ha	0,560	0.330
	40 t/ha	0,623	0.346
R2	0 t/ha	0,500	0.290
	20 t/ha	0,550	0.323
	40 t/ha	0,600	0.340
R3	0 t/ha	0,506	0.293
	20 t/ha	0,550	0.323
	40 t/ha	0,620	0.336

Regarding the phosphorus content of plants, we observe that it is not influenced by the sewage sludge fertilization. This might be explained that the sludge has not a high content in phosphorus, it is known as an organic fertilizer with nitrogen and potassium specially.

The content in total phosphorus of maize grains is between 0.4 % and 1.2 %.

In the control variants, the content in phosphorus is between 0.500 % and 0.510 % in 2003 -2005.

When we applied 20 t/ha sludge the content in phosphorus of maize grains is find between 0.550 % and 0.560 %.

The maxim dose of sewage sludge does not produce important modification of phosphorus content, and the values are between 0.600 % and 0.623 %.

In all the variants, the content in phosphorus from the maize grains is finding in the known limits, no matter what is the sludge dose.

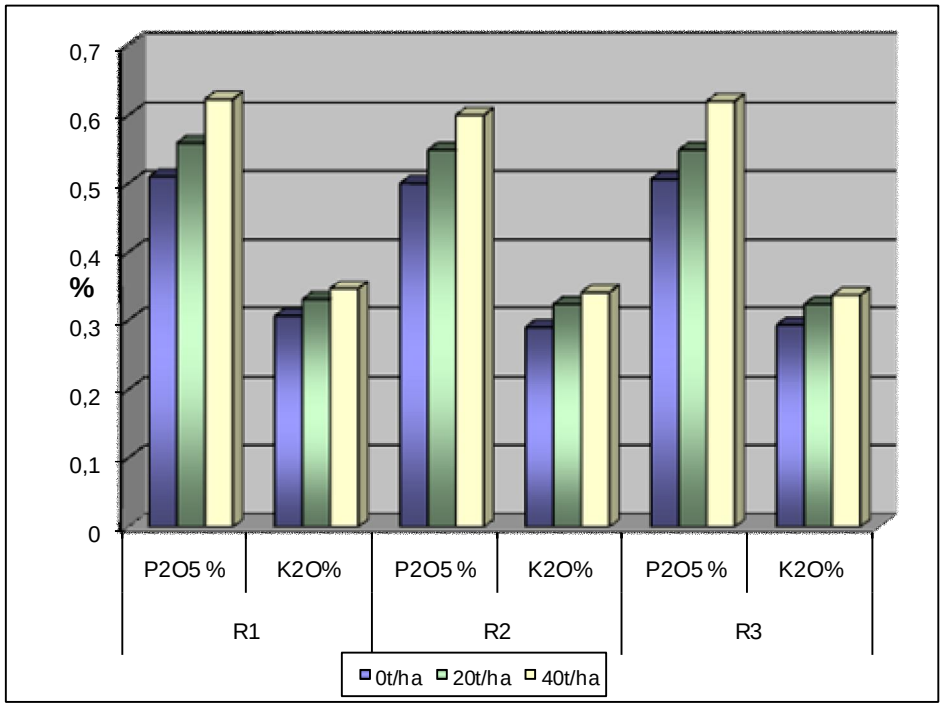

Fig. 3 The effect of sewage sludge fertilization over the content of phosphorus and potassium of the maize grains between 2003 and 2005

In maize grains the potassium content in find between 0.25 % and 0.5 % K_2O.

The content in potassium is changing after the sewage sludge fertilization, once with the sludge dose.

In control variants, the potassium content of maize grains is between 0.290 % and 0.306 % between 2003 and 2005.

The variants fertilized with 20 t/ha have the following values of potassium content 0.323 % and 0.330 %.

In variants where we applied 40 t/ha sludge, the maxim dose, the content in potassium is between 0.336 % and 0.346 %.

In all the experiment variants, the content in potassium of maize grains is finding between the known limits, after the sludge dose applied.

CONCLUSIONS

Sewage sludge is considered an organic fertilizer that results from the industry, especially from the water waste treatment.

On short and middle time, agricultural utilization of sewage sludge is a solution for the future, in purpose to depolute the environment and to improve the soil's properties.

Maize crop fertilization with sewage sludge has as result the obtaining of a food for animals with high quality value and not polluted with heavy metals.

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